

REMARKS

Claims 1-24 were examined. By present amendment, claims 1, 3, 4, 8, 9, 10, 17, 21, 23 and 24 were amended to more particularly point out and distinctly claim the subject matter that the Applicant regards as the invention. No claims have been canceled, no claims have been added, and no new matter has been added to the application. Thus, after entry of this Amendment, claims 1-24 will remain pending in the application.

Allowable Subject Matter

Applicant gratefully acknowledges the allowance of the Examiner's indication that claims 4 and 17-18 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. §112, second paragraph, set forth in the Office action and to include all of the limitations of the base claim and any intervening claims.

Rejections under 35 U.S.C. §112, second paragraph

Claims 1-20 and 23 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

A. The Patent Office stated that claim 1 is indefinite due to the use of "possibly" in conjunction with a third stage, and suggested replacing "possibly" with "optionally." In response, Applicant has amended the claim as suggested by the Patent Office.

B. The Patent Office also stated that it is unclear what is meant in claim 1 by the use of "following" on line 3 of that claim. Applicant states that use of "following" in line 3 of claim 1 refers to the melt portion fed in the second stage following the melt portion fed in the first stage.

Applicant has amended claim 1 for clarification to recite "...in a second stage adding a physical propellant at elevated pressure to a second melt portion and injecting the second melt portion containing the propellant into the cavity...." Support for feeding the mixture of propellant and melt simultaneously into the cavity maybe found at page 8, lines 19 to 22 of the English text of the preliminary amendment.

C. The Patent Office also stated that "the intermediate cycle times" in claims 3, 9, 17 and 23 lack antecedent basis within the claims. Applicant notes that the terms "the intermediate cycle times" also is found in claim 4. In response, Applicant has amended claims 3, 9, 17 and 23 to recite "an intermediate cycle time," and has amended claim 4 to recite "the intermediate cycle time" for consistency with amended claim 3 from which it depends.

D. The Patent Office also stated that "the critical propellants" in claim 8 lack antecedent basis within the claims. In response, Applicant has amended claim 8 to recite "a critical propellant."

Withdrawal of each of the rejections is respectfully requested.

Rejections under 35 U.S.C. §103(a)

A. Claims 1-2, 5-16, 19-20 and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,136,220 to Olabisi.

The Patent Office stated that Olabisi discloses the basic claimed method including (1) in a first stage, feeding a propellant-free melt portion into a cavity, and (2) in a second stage, adding a physical propellant at elevated pressure to the melt portion, wherein metering (or coordinating the fluid flow rate and pressure) of the propellant in the second stage occurs in a pressure regulated manner and the pressure exerted on the propellant during injection is greater than the pressure exerted between or after addition (because the propellant flows toward an area of lower pressure),

and the expansion of the propellant occurs in the cavity as it forces the melt against the walls of the mold cavity. The Patent Office acknowledges that Olabisi fails to disclose that the propellant of Olabisi is under a lower pressure at some point before injection, and concludes that such would be an obvious modification to one of ordinary skill in the art at the time of the invention.

Applicant respectfully disagrees.

In addition to failing to disclose that the propellant is under a lower pressure before injection, Olabisi fails to disclose, teach or suggest the process of amended claim 1, of feeding a propellant-free first melt portion into a cavity, and adding a physical propellant at elevated pressure to a second melt portion and injecting the second melt portion containing the propellant into the cavity, or to provide any or motivation for modifying the process disclosed in Olabisi to do so. The presently claimed process produces a homogeneous foam with finely distributed pores (as shown in Figure 1d.). Instead, Olabisi discloses feeding a propellant-free melt into a cavity, followed by injecting a propellant into the cavity while the propellant-free melt is in the cavity. Thus, in Olabisi, the propellant-free melt is fed into the cavity and thereafter a propellant is injected into the cavity, rather than into a second propellant-free melt portion. That is, Olabisi fails to disclose injecting a mixture of melt and propellant into the cavity, after the step of injecting a first propellant-free melt portion. The structure resulting from the Olabisi process is a heterogeneous structure e.g. one that includes large spaces between webs or stringers of plastic (see Figures of Olabisi), which is quite different from the fine foam structure produced by the presently claimed invention.

Therefore, in addition to the deficiencies of Olabisi noted by the Patent Office, Olabisi suffers from the additional deficiency of failing to disclose the step of adding a physical propellant at elevated pressure to a second melt portion and injecting the second melt portion containing the propellant into the cavity. Moreover, there is no motivation in Olabisi or in the art to modify the process of Olabisi to include the foregoing step, as there is no mention of the advantages of doing so, which includes the fine cell structure disclosed in the present application.

Independent claim 1 is therefore patentable over Olabisi. The claims that depend from claim 1 directly or indirectly are patentable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

B. Claims 21-22 and 24 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,344,710 to Johnson et al. (Johnson).

The Patent Office acknowledges that Johnson fails to disclose the use of a valve as a closure mechanism in order to stop the flow of propellant, and concludes that such would be an obvious modification to one of ordinary skill in the art at the time of the invention.

Applicant respectfully disagrees.

Johnson is directed to an extrusion process which is continuous (see abstract). In such process the propellant is added continuously to the melt in a screw type extruder. Consequently, the continuous inflow of the propellant is controlled by the flow control system of Johnson.

According to the present invention the inflow of the propellant, i.e. addition to the melt, is discontinuous and pressure controlled. That is, during the propellant injection phase the pressure exerted on the propellant is increased in accordance with the amount of propellant to be metered to the melt. Due to the increased pressure the closing mechanism is opened and the propellant under pressure is injected into the melt. Then, when sufficient propellant has been added the pressure is reduced to at least below the holding pressure of the closure mechanism. That is, according to the present invention the controlled closure mechanism according to claim 21 and the pressure relief valve according to claim 24 are operated by the pressure difference. Moreover, the pressure relief valve is provided before the injection point as set out on page 10, lines 12 to 13 and as claimed in claim 24. The use of a pressure relief valve in accordance with claim 24 ensures that the propellant remains in compressed state even during the intermediate cycle time before and after or between the propellant injection phases, which is useful for, among other things, critical propellants such as

carbon dioxide. For physical propellants a controlled closure mechanism is sufficient. Accordingly, during the propellant injection phase, the pressure is increased at least above the holding pressure of the closure mechanism, or the pressure is increased at least above the holding pressure of the closure mechanism or the pressure relief valve, so that the closure mechanism or relief valve is opened; whereas in the intermediate phases with no propellant addition the pressure is reduced below that holding pressure and the mechanism or valve is closed.

Johnson fails to disclose, teach or suggest the discontinuous the addition of a propellant or controlling the discontinuous addition of a propellant by pressure control on the propellant. Consequently, there is no motivation to provide a means for such pressure controlled addition of propellants.

Independent claims 21 and 24 are therefore patentable over Johnson. The claims that depend from claims 21 and 24 directly or indirectly are patentable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

Art Unit: 1732
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CONCLUSION

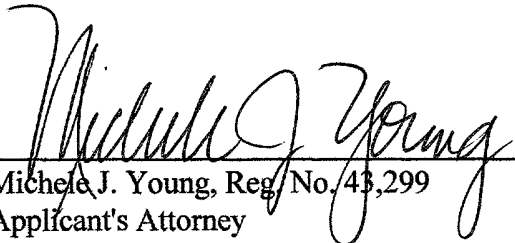
In view of the foregoing amendments and remarks, the Applicant respectfully submits that all of the claims pending in the above-identified application are in condition for allowance, and a notice to that effect is earnestly solicited.

If the present application is found by the Examiner not to be in condition for allowance, then the Applicant hereby requests a telephone or personal interview to facilitate the resolution of any remaining matters. Applicant's attorney may be contacted by telephone at the number indicated below to schedule such an interview.

The U.S. Patent and Trademark Office is authorized to charge any additional fees incurred as a result of the filing hereof or credit any overpayment to our deposit account #19-0120.

Respectfully submitted,
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